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ABSTRACT

Studies of college students have documented a minimal relationship between academic and nonacademic accomplishments and between academic achievement and creative abilities. However, a higher relationship has been shown between productive thinking and nonacademic accomplishments. In this study such relationships are assessed in 2 college populations at the University of Illinois: (1) all freshmen admitted into a special program for high-risk students in 1970, and (2) a comparison random sample of students regularly admitted that same year. Results of a questionnaire indicated that (1) for regular students: all measures of academic ability and achievement were significantly interrelated; productive thinking was related to ability and college achievement for males but was related to no other variables for females; and nonacademic activities score was related to no other variables for males but to ability, high school achievement, and productive thinking for females; and (2) for special students: while academic ability measures were related and achievement measures were related, ability and achievement were not significantly correlated; productive thinking was related to ability for males but to no other variables for females; nonacademic activities score was related to no other variables; and although special students had consistently lower scores on measures of ability, achievement, and productive thinking, they did not differ on number of nonacademic attainments. (Author/HS)

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Table of Contents

	Page
List of Tables	iii
Acknowledgements	iv
Abstract	v
I. Introduction	1
Research on Creativity	1
Prediction of College Achievement: Aptitude Scores and High School Percentile Rank	3
The Larger Question: Talent in College Populations	3
II. Procedures	5
Selection of Subjects	5
Preparation of Instruments	5
Data Collection	6
III. Results	7
Scoring Procedures	7
Number and Representativeness of Respondents	9
Ability	11
Time on Questionnaire	14
Productive Thinking	14
Nonacademic Activities	14
Correlational Analysis of Interrelationships	21
Extreme-Groups Analysis of Interrelationships	24
Other Analyses	26
IV. Discussion	27
Findings for Regularly Admitted Students	27
Comparison with Wallach-Wing Results	27
Findings for Specially Admitted Students	28
Differences Between Ability Measures	29
Implications	30
References	32
Appendices	
I. Research Questionnaire: Ideational Productivity and Nonacademic Activities	I-1
II. Supplementary Analysis: Implicit Time Constraints in the Measurement of Productive Thinking	II-1

List of Tables

		Page
1.	Intercorrelations Among Productive Thinking Item Pairs	8
2.	Intercorrelations Among Productive Thinking Tasks	8
3.	Percent of Sample Participating	10
4.	Characteristics of Respondents by Sex: Specially Admitted Students	12
5.	Characteristics of Final Sample by Group and Sex	13
6.	Mean Number of Ideas Produced	15
7.	Percent of Subjects by Group and Sex Endorsing Each Self-Descriptive Item	17
8.	Intercorrelations of Selected Variables for Males	22
9.	Intercorrelations of Selected Variables for Females	23
10.	Extreme-Group Analysis by Domain: Significance Levels of t Tests	25
Appendix 2, Table 1.	Mean Scores for Mail and Subject Pool Respondents	II-2
Appendix 2, Table 2.	Intercorrelations of Selected Variables for Males	II-4
Appendix 2, Table 3.	Intercorrelations of Selected Variables for Females	II-5

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Robert J. Menges

Abstract

Studies of college students have documented a minimal relationship between academic and nonacademic accomplishments and between academic achievement and creative abilities. However a higher relationship has been shown between productive thinking and nonacademic accomplishments. In this study such relationships are assessed in two college populations at the University of Illinois (Urbana-Champaign): (a) all freshmen admitted into a special program for high-risk students in 1970, and (b) a comparison random sample of students regularly admitted that same year.

During the summer preceding matriculation, subjects were offered a small payment for completing a mail questionnaire designed to measure productive thinking and to identify talented nonacademic accomplishments. A 40% return rate yielded responses for 265 regularly admitted and 95 specially admitted students who were representative of their populations on measures of academic ability and achievement.

For regular students: all measures of academic ability and achievement were significantly interrelated; productive thinking was related to ability (SCAT-V) and college achievement (GPA) for males but was related to no other variables for females; and nonacademic activities score was related to no other variables for males but to ability (ACT-V), high school achievement, and productive thinking for females.

For special students: while academic ability measures were related and achievement measures were related, ability and achievement were not significantly correlated. Productive thinking was related to ability (SCAT-V) for males but to no other variables for females. Nonacademic activities score was related to no other variables. Although special students had consistently lower scores on measures of ability, achievement, and productive thinking, they did not differ on number of nonacademic attainments.

Contrary to previous research, these results suggest that productive thinking may be no more useful than academic characteristics for predicting nonacademic attainments. Indeed, no relationships documented in the study were of more than modest predictive power. Implications are drawn for the selection of college students.

I. Introduction

This study examines data on the interrelationships among ability, achievement, productive thinking, and nonacademic activities in college students of varying educational backgrounds. The introductory chapter summarizes some previous work on creativity and on prediction of achievement in college and discusses the larger topic of talent among college students.

Research on Creativity

The emphasis in this study is on the production of ideas as one operationalization of the construct, creativity. Presence of high ideational productivity may not be identical to or sufficient for the presence of creativity, but it is probably a necessary condition. Thus, productive thinking is treated as a correlate of creativity.

In a later section, research is cited which assesses creativity more directly by focussing on nonacademic creative products. Such research may serve in part to validate productive thinking as a component of creativity.

Ideational Productivity as a Correlate of Creativity. After reviewing the notions of creativity held by many researchers, Shouksmith (1970) identified a recurring idea: thought processes characterized by openness. His sources implied that "the essential characteristic of the creative think [is] his free flow of ideas, which are often novel and out of the ordinary" (p. 105). In their review of historical and anecdotal data, Wallach and Kogan (1965) contended that the essence of the creative act lies in the ability to produce associates, particularly unique associates.

It is therefore not surprising that the instruments used by Wallach and Kogan in their studies of the "creativity-intelligence distinction" call for the production of associates. The following tasks are illustrative: a) The student is presented verbally with two objects and is requested to describe possible similarities between them. b) The student is presented with a simple line drawing and is asked to tell all the things it makes him think of. Thus some tasks utilize verbal and some visual stimuli. Responses are scored for fluency, i.e., total number of responses (with a crude quality criterion of "appropriateness"), and for uniqueness, i.e., statistical rarity in the sample.

Wallach and Kogan's aim was to identify tasks which display high internal consistency but which show low relationships with ability test scores or with IQ. "On both these counts the battery rates well," according to Crockenberg's review of creativity tests (1972, p. 37). Tyler's review states, "In general, the conclusion that had been put forward in 1965 by Wallach and Kogan that the two kinds of ability [creativity and intelligence] are somewhat independent of one another has been supported" (1972, p. 185).

Their test development process by no means insures that what is being measured is creativity. Quite clearly it is different from intelligence or academic ability, but what is it most appropriately called? Productive thinking or ideational productivity seem conservative and accurate labels since they describe the operations called for. Additional data could shed light on the relationship with creativity if those data provided information about the incidence of real-world talented accomplishments. For example, do persons with high ideational productivity scores also originate more creative products in nontest settings?

Direct Measurement of Creative Attainments. The most common direct method of assessing creative attainments employs a checklist on which a person indicates activities in which he has been engaged. High school and college students with whom most of this research has been done typically are accurate in their self-reports (Maxey and Ormsby, 1971). The resulting index of creative attainments, a weighted total of checked statements, can be employed as a criterion against which to validate paper and pencil measures of creativity.

Torrence (1969) reports that adult creative achievements were predicted by scores on his battery of creativity tests taken 7 years earlier. Schaefer and Anastasi (1968) and Anastasi and Schaefer (1969) have developed a biographical inventory from which can be identified students nominated by teachers on the basis of their creative products.

Checklists have been used for some years in the research of the American College Testing Program. Their work with thousands of students has documented a moderate but stable relationship between incidence of talented accomplishment in high school and in college, i.e., consistency over time. They have in general found no relationship between such nonacademic attainments and scores on ability or achievement tests (Richards and Lutz, 1968; Holland and Richards, 1965, 1966).

A study of a volunteer sample of freshmen accepted by Duke University (Wallach and Wing, 1969) used both a nonacademic activities checklist and the Wallach and Kogan productive thinking tests. Results showed the incidence of creative attainments to be related to ideational productivity at least in some activity domains. Neither nonacademic activities nor productive thinking were related to ability or achievement.

Thus there is some evidence that creative or talented accomplishments which occur outside the classroom can be predicted by scores on paper and pencil instruments. However, there is apparently no relationship between either of those measures and academic achievement or ability. Of course, it is tested ability and not nonacademic accomplishment which serves as the basis for selection in higher education. And it is to the problem of predicting success in college that we now turn.

Prediction of College Achievement: Aptitude Scores and High School Percentile Rank.

Since results of tasks calling for similar abilities are likely to be highly correlated, it is not surprising that the best predictors of undergraduate grade point average (GPA) are achievement in high school and scores on tests of academic aptitude. Studies of the prediction of college grades from such tests, including the Scholastic Ability Test (SAT) and the American College Testing Program Test (ACT), typically find correlations of about .50 ranging from .30 to .70. When high school percentile rank is combined with one or more tests, the correlation rises to approximately .65 (Lavin, 1965).

Because GPA is the sine qua non of college success--it is usually GPA that determines who stays in and who fails out--and because these measures are its best predictors, they are likely to continue to enjoy widespread use. But they are not without weaknesses. Such predictors virtually never account for more than 50% of the variance in GPA, although they are highly reliable and robust. They have been criticized even by test makers as elitist and discriminatory (College Entrance Examination Board, 1970). Finally, there is the criterion problem. GPA is known to be related to further success in schooling but to not much else (Berg, 1970; Harmon, 1963; Hoyt, 1965; MacKinnon, 1968). Although GPA is assumed to be "a promissory note for post-schooling attainments" (Wing and Wallach, 1971, p. 5), it has not been validated as such. Nevertheless, its continued use is insured by its reliability and predictive validity within school settings, rather than by any demonstrated relationship with nonschool accomplishments or by any compelling intrinsic worth of the operations it represents.

Problems in the use of checklists of nonacademic accomplishments reside less with concern about the intrinsic value of accomplishments they represent and more with attendent measurement problems (Richards and Lutz, 1968).

The Larger Question: Talent in College Populations.

The present concern is how these several indicators of talent are related in college populations. This study asks particularly how three variables--academic ability defined by college admissions test, achievement in high school defined by rank in class, and productive thinking score--are related to two other measures--achievement in college defined by GPA and talented nonacademic activities assessed by a checklist.

Wallach and Wing (1969) asked these questions of data collected from freshmen admitted in 1967 to Duke University.

> What we have found can be put quite directly. Within the intelligence range defined by our sample--and it is a sample that falls overall within the upper part of the intelligence continuum--intelligence level [measured by SAT score] is indeed strongly related to grades. But only to grades. Intelligence is not at all related to level or

> quality of attainment in any of the diverse forms of extracurricular involvement that we studied--and these covered the entire range from literary and artistic pursuits through dramatic and musical performance, social service activities, and scientific work on one's own to leadership in student organizations. On the other hand, a person's resourcefulness in generating ideas--what may best be understood as his typical degree of energy with respect to producing thoughts--although it cannot be predicted from intelligence level, is substantially related to the quality of his contribution in all extracurricular domains that share a common emphasis upon innovation of one kind or another: namely, leadership, where political strategems and plans for political action are formed; art, where paintings, drawings and sculpture are created; writing, where words are turned into poetry or prose; and scientific work, where plans for research are developed and carried out (Wallach and Wing, 1969, pp. vi-vii).

In the present study similar data are gathered from a population at a selective public university. Two groups are studied: a) a random sample of freshmen regularly admitted to the University of Illinois (Urbana-Champaign) in 1970, and b) all students admitted that same year to the University's Special Educational Opportunities Program (SEOP). Most SEOP students are black and come from innercity high schools. Few would be admitted to or be able to afford the University without assistance provided by the SEOP. Because they typically have lower tested ability and high school achievement than regularly admitted students, findings will represent a broader range of ability than has been the case in previous research.

II. Procedures

Selection of Subjects

Samples from two populations are included in the study. Of all new 1970 freshmen regularly admitted to the University of Illinois (Urbana-Champaign) a sample of approximately 14% was drawn (termed regular students). Every seventh name was selected by the University's Central Data Processing computer.

The second sample included all new 1970 freshmen admitted to the Special Educational Opportunities Program (termed special or high-risk students). A subsample of respondents was later selected for interviewing according to a predetermined pattern of test scores, sex, and admission group.

Preparation of Instruments

Questionnaire. A paper and pencil questionnaire to assess ideational productivity and nonacademic activities was adapted from Wallach and Wing (1969). The 12-item ideational productivity instrument was taken directly from their work with permission and is reproduced in condensed form in Appendix I. Each of four items has three parts. The first item, "uses," lists three objects and for each object asks for "all the different ways you can think of in which the object might be used." The second, "pattern meaning," reproduces three patterns and for each pattern asks for "all the different things you can think of that each pattern might suggest." The third, "similarities," names three pairs of objects and for each pair asks for "all the different ways you can think of in which the two objects might be alike." The fourth, "line meanings," reproduces three line sketches and for each sketch asks for "all the different things you can think of that each complete line might suggest." Consequently there were presented in mixed order two verbal tasks (uses and similarities) and two visual tasks (pattern meanings and line meanings).

Nonacademic activities were identified by a 53-item checklist also reproduced in Appendix I. This checklist includes 3 categories and 19 items not used by Wallach and Wing. The new categories, Vocational Arts (outside of class), Sports, and Business, were considered important activities for high school years and perhaps especially for high-risk students. Other items were added to detect participation in social action projects and in alternative culture (underground) activities. In the appendix the original Wallach and Wing items are denoted "W" and the new Menges items are denoted "M".

The checklist was tested with 25 students, both regular and special and both male and female. Its final form is the result of suggestions from that pilot group.

Care was taken in the covering letter (Appendix I) to emphasize that responding is a free choice and that information is to be used only for research purposes. No time limit was specified. Payment of $3.00 was offered for a promptly returned completed questionnaire.

Interview schedule. Instructions for an unstructured interview were prepared following the format of Perry's (1970) study. Interviewers were to focus discussion around the general question, "As you look back on this year on campus, what things stand out for you," and later, "If you had a good friend, someone a lot like yourself, who was coming here next year, and he (she) asked you what to expect and so on, how do you think you might answer?" Interviewees were offered $4.00 for their cooperation.

Data Collection

Questionnaire. The questionnaire was mailed to all subjects in early August, 1970. Enclosed was a return, postage-paid envelope addressed to the New Student Project, Psychology Building. Returned questionnaires began arriving almost immediately and continued until the start of classes in September. At that time the relatively low return rates suggested that further means be investigated for increasing sample size. Two such attempts were made.

For the high-risk students who had not responded, a second mailing was sent to campus addresses early in the semester. The sample of regular students was augmented through the department's subject pool. In mid-October one hundred subject pool members, regularly admitted freshmen not originally sent a questionnaire, were scheduled for a two-hour evening session where they completed the questionnaire. For that effort they received two hours credit toward their five-hour course requirement of participation in psychological research.

Other quantitative data. Permission was given by the University to obtain from Central Data Processing the following information for each member of the sample: American College Testing Program composite score (ACT-C), School and College Ability Test verbal score (SCAT-V), high school percentile rank (HSPR), and first semester grade point average (GPA).

All quantitative data were keypunched. Only group analyses were carried out so that it could not be determined from the processed data how any individual performed in the study.

Interviews. Interviews were conducted during the second-to-last and third-to-last weeks of the spring (1971) semester. Each of the four interviewers was an advanced doctoral student in clincial or counseling psychology. Interview appointments were made by telephone and interviews were held in a Psychology Building research room reserved for that purpose. With the consent of the subject, the interview was tape recorded.

III. Results

Scoring Procedures

Productive thinking. Raw scores for each student were derived by counting the number of acceptable responses across items. Some tasks elicited a larger mean number of acceptable responses than others. In order that each task receive equal weight, the distribution of scores for each task was converted to standard score units. Each subject's score used in data analysis was the sum of his four standard scores, which expressed his performance in relation to all members of the sample.

Two questions about the adequacy of these data can now be asked. First, how reliable was the scoring? Each response was judged acceptable or unacceptable by one of two undergraduate research assistants. They were trained by independently scoring 20 questionnaires selected at random and then discussing and resolving disagreements. After training, they achieved 92.6% agreement in independent scoring of a new sample of 20 questionnaires.

The second indication of adequacy of these scores concerns their internal consistency. Two expectations may be stated. First, responses to pairs of items in the same task should be highly correlated. Table 1 indicates that for regular students each of the 12 correlations is .62 or higher and 5 are .73 or higher. For special students the lowest is .53, 9 are .60 or higher and 1 is .76. For both groups of students the visual tasks may be somewhat more homogeneous than the verbal tasks.

Second, correlations among tasks should be lower than correlations among the item pairs within tasks. Table 2 shows this not to be the case; correlations across tasks are of the same order as correlations among pairs of items within tasks. All items are apparently calling for very similar operations from subjects. These correlations are of magnitude similar to those reported by Wallach and Wing (1969, p. 41).

In summary, productive thinking items were scored with adequate reliability and have high internal consistency.

Nonacademic activities. A subject's score on the nonacademic activities checklist was simply the sum of items checked, subject to two corrections. The score could be raised if the scorer interpreted an item written in on the last page of the questionnaire--there were few such responses--to be equivalent to one of the checklist items. Second, in order to approximate equal weights for the 10 domains and to make results comparable to Wallach and Wing's results, a maximum score of 3 was established for each category; i.e., a subject received a score of 3 if he checked 3 or more items in a given category. The maximum score across the ten categories then is 30. Since the number of items ranges from 3 for Business to 9 for Literature, some categories potentially reward a greater variety of behaviors than do other categories. The major effect of this score limitation is probably reduced discrimination

Table 1

Intercorrelations Among Productive Thinking Item Pairs

Item Pairs	Uses	Patterns	Similarities	Lines
1-2	62[a]	79	66	76
	63[b]	60	53	67
1-3	64	73	62	75
	56	62	59	67
2-3	69	70	66	74
	64	64	64	76

[a]Regularly admitted students (N=265)

[b]Specially admitted students (N=95)

Table 2

Intercorrelations Among Productive Thinking Tasks

	Uses	Patterns	Similarities	Lines
Uses	---			
Patterns	65[a]	---		
	61[b]			
Similarities	61	65	---	
	63	64		
Lines	61	79	66	---
	71	70	62	

[a]Regularly admitted students (N=265)

[b]Specially admitted students (N=95)

among persons who are highly active. Those whose activity has great breadth across domains receive the highest scores. There is evidence that responses in general were honest. That is, a smaller proportion checked more unusual activities (e.g., receiving award for activity X) than more common activities (e.g., member of activity X).

New items were added to the checklist to tap important additional activities. The substantial correlations between scores based on all items and scores based only on Wallach and Wing items suggest that the new items added little to the comprehensiveness of the questionnaire. For regular students these correlations are .93 (males) and .93 (females). For special students, .87 (males) and .93 (females). What may have been gained by new items and categories was perhaps suppressed by the ceiling on the domain score. Subsequent correlations in this report are based on scores across all nonacademic activity items. On the other hand, when responses are considered on an item by item basis, the Menges items do reveal additional differences by sex and between regular and special students. This analysis is reported below and shown in Table 7.

Interviews. From available interviews, 12 protocols were rated by two judges. The sample included regular and special students (both males and females). For each group there were two subjects high on one of the following variables and moderate on the other two variables: ACT-C, productive thinking, nonacademic activities. Two raters were asked to rank the relative importance of those three variables from each protocol. They did so at an above chance level, thus suggesting congruence between characteristics revealed in an unstructured interview and through psychometric instruments.

Available research support was not sufficient for further analysis of the interview data.

Number and Representativeness of Respondents

Percent responding. Table 3 shows that fewer than half of those invited to participate actually completed questionnaires. The rate varied from a low of 16% (for females in the special student second mailing) to a high of 92% (among males invited to the subject pool session). Analyses are based on 19 fewer cases than the total of 468 shown in Table 3. The following deletions from the sample were made: 12 persons who did not matriculate, 3 persons who indicated they spent less than .3 hour on the questionnaire (judged to be insufficient time), and 4 persons in the subject pool who provided incomplete responses.

This overall rate of response is not unusually low for questionnaire studies. The rate's adequacy, of course, must be assessed in terms of respondents' similarity to the population.

Representativeness of respondents. Since the regular student sample and the special student sample each have two parts, it is first necessary to determine if the parts are representative of the same

Table 3

Percent of Sample Participating

Regular Students

Mail				Subject Pool				Total	
Males		Females		Males		Females			
N	%	N	%	N	%	N	%	N	%
143	33.8	135	46.9	55	91.7	38	90.5	371	45.6

Special Students

Mailing I				Mailing II				Total	
Males		Females		Males		Females			
N	%	N	%	N	%	N	%	N	%
24	22.9	46	34.1	15	21.4	12	15.8	97	40.5

population.

1. Regular students: Mail vs. Subject Pool. A comparison of these groups is given in Appendix II ("Supplementary Analysis: Implicit Time Constraints in the Measurement of Productive Thinking"). It is shown that the mail sample did not differ from the subject pool sample on ACT-C, SCAT-V, HSPR, and first semester GPA. However the mail sample spent significantly more time on the questionnaire ($p < .002$), gave significantly more responses to the productive thinking items ($p < .02$), and checked significantly more nonacademic activities ($p < .05$). Intercorrelation matrices shown in Appendix II suggest that relationships are more complex than merely a suppression of response under the implicit time constraints of the subject pool session. In particular, HSPR seems to function differently for males in the mail group than in the subject pool group. For these reasons it was determined to delete the subject pool group from further analyses as not representative of test conditions sought in the study. Therefore, the basis for all subsequent analyses is the mail respondents, 265 regular students (M=139, F=126).

2. Special students: Mailing I vs. Mailing II. On the seven variables reported in Table 4, no differences were noted between the two mailing groups. Consequently, they were combined and the basis for subsequent analyses is 95 special students (M=39, F=56).

3. Sample of Regular Students vs. Population. On three variables it was possible to compare those who returned questionnaires with all 1970 regularly admitted freshmen. The means for all regularly admitted freshmen (approximately 5500) are as follows: ACT-C, 26.4; HSPR, 85.0; first semester GPA, 3.82. As shown in Table 5, the means for those variables for the sample (N=265) are ACT-C, 26.3; HSPR, 86.1: GPA, 3.96. The difference between GPA appears to be significant (it could not be tested because the population variance is unknown); however its practical significance is small. The respondents are representative of the class as a whole at least on these academic variables.

4. Sample of Special Students vs. the Population can be compared on the same three variables. The means for all students admitted into the Special Educational Opportunities Program in 1970 and presenting ACT scores (N=215) are as follows: ACT-C, 17.3; HSPR, 70.2; first semester GPA, 3.24. According to Table 5, the means for this sample (N=95) are ACT-C, 17.6; HSPR, 70.3; GPA, 3.25. The respondents are representative of the population at least on these academic variables.

Ability

Data are available for four variables related to academic ability: ACT-C, SCAT-V, HSPR, first semester GPA. Table 5 presents data on these variables by sex and by regular and special group.

ACT-C. Among regularly admitted students males have significantly higher ACT-C scores than females ($p < .002$). There is no sex difference

Table 4

Characteristics of Respondents by Sex: Specially Admitted Students

		Mailing I				Mailing II				Total Mailing I	Total Mailing II		
		M	F	t	p	M	F	t	p				
	N	26	42			13	14			68	27		
ACT-C	M	17.96	17.21	.80	n s	16.38	19.07	1.88	.1	17.50	17.78	.32	n s
	SD	4.56	3.17			3.86	3.56			3.75	3.89		
	N	24	39			12	13			63	25		
SCAT-V	M	16.67	18.26	.97	n s	15.17	21.77	3.07	.01	17.65	18.60	.64	n s
	SD	6.28	6.36			5.22	5.51			6.33	6.24		
	N	25	42			13	14			67	27		
HSPR	M	64.44	72.19	1.49	n s	73.15	72.36	.08	n s	69.30	72.74	.69	n s
	SD	22.50	19.50			24.22	24.87			20.84	24.09		
	N	24	41			13	13			65	26		
GPA	M	3.29	3.16	.52	n s	3.18	3.50	1.06	n s	3.21	3.34	.64	n s
	SD	.86	.99			.65	.84			.94	.75		
	N	26	38			11	14			64	25		
Time	M	1.27	.94	1.39	n s	.67	1.31	.92	n s	1.07	1.03	.16	n s
	SD	1.16	.74			.25	2.26			.94	1.70		
Prod	N	26	42			13	14			68	27		
thkg	M	49.38	52.33	.51	n s	49.69	53.14	.40	n s	51.21	51.48	.05	n s
	SD	25.72	21.81			14.40	28.01			23.24	22.16		
	N	26	42			13	14			68	27		
Non-ac	M	13.19	12.83	.24	n s	12.62	9.79	1.21	n s	12.97	11.15	1.32	n s
	SD	5.93	6.21			5.58	6.53			6.06	6.14		

Table 5

Characteristics of Final Sample by Group and Sex

		Regular				Special							
		M	F	t	p	M	F	t	p	Total Regular	Total Special	t	p
ACT-C	N	139	126			39	56			265	95		
	M	27.06	25.52	4.20	.002	17.44	17.68	.31	n s	26.33	17.58	22.38	.002
	SD	2.68	3.28			4.36	3.34			3.07	3.77		
SCAT-V	N	138	126			36	52			264	88		
	M	31.43	32.24	.70	n s	16.17	19.13	2.23	.05	31.82	17.92	13.03	.002
	SD	9.23	9.43			5.92	6.30			9.32	6.28		
HSPR	N	139	126			38	56			265	94		
	M	84.85	87.52	1.79	.1	67.42	72.23	1.05	n s	86.12	70.29	8.64	.002
	SD	13.45	10.50			23.15	20.73			12.19	21.75		
GPA	N	138	124			37	54			262	91		
	M	3.87	4.06	2.14	.05	3.25	3.24	.05	n s	3.96	3.25	7.64	.002
	SD	.72	.71			.78	.96			.72	.89		
Time	N	139	124			37	52			263	89		
	M	1.10	1.13	.40	n s	1.09	1.04	.21	n s	1.12	1.06	.55	n s
	SD	.60	.68			1.01	1.32			.64	1.19		
Prod thkg	N	139	126			39	56			265	95		
	M	63.06	78.12	4.22	.002	49.49	52.54	.64	n s	70.22	51.28	5.60	.002
	SD	25.27	32.71			22.38	23.24			29.95	22.82		
Non-ac	N	139	126			39	56			265	95		
	M	11.14	12.98	2.76	.01	13.00	12.07	.73	n s	12.01	12.45	.65	n s
	SD	5.32	5.52			5.75	6.37			5.48	6.11		

among special students. As a group, regular students score much higher than special students ($p < .002$); the difference between their means is approximately 3 times the standard deviation of the regular group.

SCAT-V. There is no sex difference for regular students on SCAT-V. Females in the special student group scored higher than males ($p < .05$). The difference between all regular students and all special students is highly significant ($p < .002$) with the former scoring higher.

HSPR. No sex differences in HSPR were found for either regular or special students. However the former had a considerably higher mean rank ($p < .002$).

GPA. At the end of their first semester, females in the regular group had significantly higher GPA than did males ($p < .05$). No sex difference was found for special students. Regular students had significantly higher GPAs than did special students ($p < .002$), a mean difference of about .7 of a grade point.

To summarize results of ability measures, although the pattern of sex differences was equivocal, regularly admitted students scored significantly higher on each measure than did special students.

Time on Questionnaire

Self-reported time spent filling out the questionnaire, if reported honestly, may be taken as an indication of motivation. Table 5 shows neither sex differences nor group differences in time spent on questionnaire. Although there was greater variability for special students, the mean time of each group was slightly over one hour. Therefore any differences found in patterns of scores should not be the result of differential time on task.

Productive Thinking

According to Table 5, productive thinking scores for regular students differed by sex with women scoring higher ($p < .002$). No sex difference was found for special students. Overall, regular students scored significantly higher than special students ($p < .002$), generating on the average 19 more acceptable responses.

Scores by task are shown in Table 6 (these unstandardized means were added across tasks to obtain the scores shown in Table 5). Females in the regular group scored significantly higher on each task. No task shows a sex difference for special students. It appears that no particular task was responsible for the regular students higher mean.

Nonacademic Activities

According to Table 5, females among regular students reported significantly more activities than did males ($p < .01$). Special students did not differ by sex. Regular students did not differ significantly

Table 6

Mean Number of Ideas Produced

	Regular				Special			
	M (N=139)	F (N=126)	t	p	M (N=39)	F (N=56)	t	p
Uses	20.04	24.59	3.90	.002	16.15	16.66	.31	n s
Patterns	13.04	17.43	4.00	.002	9.13	10.04	.80	n s
Similarities	15.30	17.37	2.44	.02	13.46	13.75	.21	n s
Lines	14.67	18.73	3.86	.002	10.74	12.09	.94	n s

from special students, although the average special student reported about "half an activity" more.

An item by item analysis is presented in Table 7. The χ^2 test was applied to the proportion endorsing each item comparing same sex groups both within and across regular and special categories. Probability levels of .10 or less are noted.

First, consider sex differences within the regular or special group. In general, they are congruent with cultural expectations and thus support the honesty of responses. For example, among regular students females are more active than males in student organizations, in fine arts activities, and in child care or tutoring programs. While females are more likely to play a musical instrument or sing, males are more likely to engage in music professionally. Males are also more likely to build science equipment, build or rebuild mechanical devices, and participate in sports.

Among special students, there were fewer sex differences, perhaps because of their smaller N. None were striking violations of social convention. Females were more likely to participate in a dance group. Males were more likely to build science equipment and to participate in sports. Although females were more likely to be involved in the business management of a school or nonschool activity, males were more likely to organize and manage a business.

When regular males are contrasted with special males, more differences emerge, although 8 of the 13 are merely at the .10 level of significance. Most show greater activity on the part of special students. For example, special students (males) were more likely to have art work exhibited or to enter it in competition, participate in Model Cities Program or Neighborhood Youth Corps, volunteer for child care or tutoring program, be involved in sports as coach or manager, or organize a business. The two items showing greater incidence for regular males concerned volunteer work in politics and playing a musical instrument.

A comparison of regular females and special females yields differences on 10 items, 3 of which are at only the .10 level. Four items favor special females: participation in Model Cities or Neighborhood Youth Corps, receiving award in a service group, activity designed to change discriminatory social conditions, and sports coaching or umpiring. Females among the regular students report greater incidence of creating fine arts objects, volunteering for political activity, writing underground publications, participating in stage or debate production, playing musical instrument, and designing clothes, jewelry, or furnishings.

In summary, students differ by sex in expected ways in their nonacademic activities. Although regular and special students report a similar <u>number</u> of activities, there are differences by <u>type</u> of activity.

Table 7

Percent of Subjects by Group and Sex Endorsing Each Self-Descriptive Item

	Male				Female				Regular				Special			
LEADERSHIP	R	S	χ^2	p	R	S	χ^2	p	M	F	χ^2	p	M	F	χ^2	p
Participated as an active member of one or more student organizations	78	79	.02	n s	89	84	.86	n s	78	89	5.23	.025	79	84	.31	n s
Nominated for or appointed to office in a student organization	67	77	1.43	n s	76	77	.00	n s	67	76	2.78	.10	77	77	.00	n s
Elected president or chairman of a student organization	31	31	.00	n s	39	36	.17	n s	31	39	1.84	n s	31	36	.25	n s
Elected president of student government or class	11	18	1.44	n s	8	13	.95	n s	11	8	.63	n s	18	13	.54	n s
ART																
Created art work such as painting, drawing, sculpturing, cartooning, photography (not as part of a course)	45	49	.21	n s	63	34	13.66	.001	45	63	9.48	.005	49	34	2.10	n s
Had art work exhibited or published	12	23	3.37	.10	22	18	.45	n s	12	22	5.48	.025	23	18	.39	n s
Entered an artistic competition or contest	9	21	4.31	.05	15	11	.62	n s	9	15	2.66	n s	21	11	1.76	n s
Won a prize or an award in art competition	8	13	.90	n s	10	4	2.33	n s	8	10	.46	n s	13	4	2.88	.10
SOCIAL SERVICE																
Actively participated in programs sponsored by community or church groups, such as Scouts, 4-H Clubs, YMCA, YMHA, CYO	62	67	.30	n s	63	64	.01	n s	62	63	.07	n s	67	64	.06	n s
Actively participated in programs of such groups as the Model Cities Program, Economic Opportunities Council, Neighborhood Youth Corps, etc.	11	51	31.61	.001	10	50	37.04	.001	11	10	.12	n s	51	50	.02	n s
Elected or appointed officer of such a group	26	15	1.87	n s	25	18	1.24	n s	26	25	.01	n s	15	18	.10	n s
Received an award or prize for work in a service group	19	18	.04	n s	17	36	7.28	.01	19	17	.17	n s	18	36	3.57	.10

Table 7 (cont.)

	Male				Female				Regular				Special			
SOCIAL SERVICE (cont)	R	S	χ^2	p	R	S	χ^2	p	M	F	χ^2	p	M	F	χ^2	p
Worked as a volunteer in a child care or tutoring program	20	36	4.19	.05	46	34	2.33	n s	20	46	20.21	.001	36	34	.04	n s
Did volunteer work for political candidates or political organization	21	3	7.28	.01	19	2	9.75	.005	21	19	.14	n s	3	2	.07	n s
Participated in activities designed to change discriminatory social conditions, such as illegal hiring practices or substandard housing	11	18	1.44	n s	11	25	5.74	.025	11	11	.01	n s	18	25	.66	n s
LITERATURE																
Wrote original poems, plays, stories, articles, essays (not as part of a course) but have not published	46	54	.74	n s	63	59	.23	n s	46	63	.07	n s	54	59	.24	n s
Published original writings in school paper	24	23	.03	n s	32	27	.45	n s	24	32	1.74	n s	23	27	.17	n s
Had original writings published in public newspaper, magazine, collection (not school publication)	9	10	.09	n s	7	11	.65	n s	9	7	.20	n s	10	11	.01	n s
Published original materials in a school or community underground newspaper or magazine	9	18	2.77	.10	11	4	2.75	.10	9	11	.46	n s	18	4	5.54	.025
Won a literary prize for creative writing	4	5	.05	n s	14	5	2.62	n s	4	13	7.02	.01	5	5	.00	n s
Worked on editorial staff of school paper or annual	21	33	2.63	n s	43	30	2.55	n s	21	43	14.86	.001	33	30	.09	n s
Worked on editorial staff of underground newspaper or magazine	7	13	1.25	n s	7	5	.20	n s	7	7	.00	n s	13	5	1.66	n s
Edited school paper or annual	10	10	.00	n s	17	13	.52	n s	10	17	2.51	n s	10	13	.11	n s
Edited an underground newspaper or magazine	4	5	.05	n s	3	4	.01	n s	4	3	.04	n s	5	4	.14	n s
DRAMATIC ARTS																
Participated in activities of speech, debate or drama group	42	46	.17	n s	56	54	.12	n s	42	56	5.11	.025	46	54	.51	n s
Participated in a dance group	8	15	1.97	n s	26	36	1.70	n s	8	26	15.94	.001	15	36	4.78	.05

Table 7 (cont.)	Male				Female				Regular				Special			
DRAMATIC ARTS (cont.)	R	S	x^2	p	R	S	x^2	p	M	F	x^2	p	M	F	x^2	p
Played minor role in cast or crew of production sponsored by school, community, or religious groups; or entered debate or speech contest	47	49	.05	n s	67	54	2.84	.10	47	67	10.64	.005	49	54	.22	n s
Received an award for acting, playwriting, or other phase of dramatic production	4	10	2.03	n s	11	11	.01	n s	4	11	4.37	.05	10	11	.01	n s
Won an award in state or regional speech or debate contest	2	5	.47	n s	9	6	.62	n s	3	9	4.23	.05	5	5	.00	n s
MUSIC																
Played a musical instrument	52	36	3.08	.10	62	38	9.31	.005	52	62	2.75	.10	36	38	.03	n s
Sang as a soloist or member of a group	27	33	.54	n s	47	50	.16	n s	27	47	10.82	.05	33	50	2.60	n s
Composed or arranged music	14	8	1.21	n s	10	13	.19	n s	14	10	1.00	n s	8	13	.56	n s
Performed music with school or community group	39	49	1.23	n s	58	54	.30	n s	39	58	9.65	n s	49	54	.22	n s
Organized or led a musical group	19	21	.02	n s	8	11	.37	n s	19	8	7.26	n s	21	11	1.76	n s
Won prize in musical competition	20	10	2.01	n s	19	16	.23	n s	20	19	.05	n s	10	16	.66	n s
Participated as a regular professional musician, or had professional performances given of music composed or arranged	11	8	.32	n s	2	4	.71	n s	11	2	9.32	.005	8	4	.78	n s
SCIENCE																
Participated as a member of a science club or reading and discussion group	31	26	.41	n s	23	23	.00	n s	31	23	2.09	n s	26	23	.07	n s
Built a piece of equipment or laboratory apparatus (not as part of a course)	26	33	.84	n s	9	5	.62	n s	26	9	13.35	.001	33	5	12.85	.001
Appointed teaching or laboratory assistant	9	21	4.31	.05	11	14	.37	n s	9	11	.46	n s	21	14	.64	n s
Entered scientific competition	17	18	.04	n s	15	11	.62	n s	17	15	.11	n s	18	11	1.02	n s
Won first, second, or third prize in a state or regional science contest	9	3	1.94	n s	9	5	.62	n s	9	9	.03	n s	3	5	.44	n s
Attended a summer science program sponsored by the National Science Foundation	4	3	.10	n s	0	2	.23	n s	4	0	4.62	.05	3	2	.07	n s

Table 7 (cont.)

	Male				Female				Regular				Special			
VOCATIONAL ARTS (OUTSIDE OF CLASS)	R	S	χ^2	p	R	S	χ^2	p	M	F	χ^2	p	M	F	χ^2	p
Designed clothes, jewelry, or household furnishings	11	18	1.44	n s	56	36	6.11	.01	11	56	60.79	.001	18	36	3.57	n s
Built or rebuilt mechanical devices such as cars and cycles	35	31	.27	n s	3	4	.02	n s	35	3	42.50	.001	31	4	13.53	n s
Had such work entered in a contest	0	3	3.58	.10	6	5	.07	n s	0	6	9.10	.005	3	5	.44	n s
Won a prize or award in such competition	0	3	3.58	.10	6	4	.32	n s	0	6	7.93	.005	3	4	.08	n s
SPORTS																
Participated in organized school or neighborhood sports (outside of class)	79	82	.16	n s	59	52	.76	n s	79	59	12.97	.001	82	52	9.16	.005
Served as captain of a team	26	31	.37	n s	26	30	.34	n s	26	26	.00	n s	31	30	.00	n s
Coached or umpired for sports events	35	51	3.62	.10	13	25	3.63	.10	35	13	15.80	.001	51	25	6.91	.01
Served as manager or cheerleader for athletic events	15	28	3.54	.10	24	20	.39	n s	15	24	3.22	.10	28	20	.95	n s
BUSINESS																
Participated in the business management of a school or nonschool activity	24	18	.59	n s	31	36	.28	n s	24	32	2.12	n s	18	36	3.57	.10
Served as business manager of a sports, newspaper, music or other group	17	21	.05	n s	10	18	2.00	n s	17	10	2.11	n s	21	18	.11	n s
Organized and managed a business for fun or money-making purposes	19	33	3.81	.10	16	16	.00	n s	19	16	.37	n s	33	16	3.85	.05

In general, regular students are more likely to do volunteer work for political candidates or political organizations and to play musical instruments. Special students show more extensive involvement in sports and business activities and in programs for social change, especially of the "War on Poverty" type.

Correlational Analysis of Interrelationships

Matrices were prepared separately for males and females showing missing data correlations for the 6 major variables in the study.

Males. Table 8 shows the matrix for regularly admitted males (upper lines) and specially admitted males (lower lines). For regular students ACT-C is significantly related to SCAT-V, HSPR, and GPA. SCAT-V is significantly related to HSPR and GPA. HSPR and GPA are significantly correlated. Productive thinking is related to SCAT-V and GPA. Nonacademic activity score is not significantly correlated with any other variable.

For special students, ACT-C and SCAT-V are significantly correlated as are HSPR and GPA. Productive thinking is significantly correlated with SCAT-V. Nonacademic activity score is not significantly related to any variables.

In summary, while all achievement and aptitude measures are interrelated for regular students, for special students aptitude predicts aptitude and achievement predicts achievement. Except for the correlation between productive thinking and SCAT-V for both groups and between productive thinking and GPA for regular students, neither productive thinking nor nonacademic activities are related to other variables or to each other.

Females. According to Table 9, for regular students ACT-C is significantly related to SCAT-V, HSPR, and GPA. SCAT-V is significantly related to HSPR but not to GPA. HSPR and GPA are significantly correlated. Productive thinking is related to no variables except nonacademic activity score which is also related to ACT-C and HSPR.

For special students, ACT-C and SCAT-V are significantly related as are HSPR and GPA. Productive thinking and nonacademic activity score are related neither to each other nor to any other variable.

Summary. Results for both sexes showed significant relationships among achievement and aptitude measures for regular students, while for special students aptitude predicts aptitude and achievement predicts achievement. Regular females' nonacademic activity score was related to productive thinking, ACT-C and HSPR, but that was not the case for males. For special females, neither productive thinking nor nonacademic activity score was related to other variables.

Despite their statistical significance, these correlations accounted for a relatively small proportion of the variance in question. If

Table 8

Intercorrelations of Selected Variables for Males

	ACT-C	SCAT-V	HSPR	GPA	Prod thkg	Non-ac
ACT-C	---					
SCAT-V	65[a] (138)[c]** 46[b] (36) **	---				
HSPR	53 (139)** 07 (38)	43 (138)** -10 (36)	---			
GPA	34 (138)** 15 (37)	28 (137)** 07 (35)	31 (138)** 41 (37)*	---		
Prod thkg	10 (139) 26 (39)	19 (138)* 37(36)*	06 (139) 07 (38)	24 (138)** 20 (37)	---	
Non-ac	07 (139) 02 (39)	-01 (138) 10 (36)	11 (139) -11 (38)	02 (138) 14 (37)	07 (139) 23 (39)	---

[a] Regularly admitted

[b] Specially admitted

[c] N given in parenthesis

* $p < .05$

** $p < .01$

Table 9

Intercorrelations of Selected Variables for Females

	ACT-C	SCAT-V	HSPR	GPA	Prod thkg	Non-ac
ACT-C	---					
SCAT-V	69[a] (126)[c]** 57[b] (52)**	---				
HSPR	47 (126)** -01 (56)	27 (126)** -09 (52)	---			
GPA	20 (124)* 12 (54)	12 (124) 24 (50)	33 (124)** 30 (54)*	---		
Prod thkg	03 (126) 13 (56)	06 (126) 21 (52)	08 (126) -04 (56)	07 (124) -07 (54)	---	
Non-ac	21 (126)* 07 (56)	17 (126) -08 (52)	34 (126)** -12 (56)	17 (124) -02 (54)	27 (126)** 12 (56)	---

[a]Regularly admitted

[b]Specially admitted

[c]N given in parenthesis

* .05
** .01

the expected high correlations between ACT-C and SCAT-V are excluded (and each of them accounts for less than 50% of the variance), of the remaining 17 significant correlations across all groups, 9 exceed .30 and 3 exceed .40.

Extreme-Groups Analysis of Interrelationships

To compare present results with those of Wallach and Wing (1969), though at the loss of some subjects, groups were formed consisting of high and low thirds on SCAT-V and on productive thinking. Separate groups were formed for men and for women. Such questions as the following could then be answered: Among females in the group of special students, do those who score in the highest third on SCAT-V differ significantly on nonacademic activity score from those who score in the lowest third on SCAT-V (t test)?

Analyses using these extreme groups, when compared with the correlational analyses (Tables 8 and 9), reveal only one discrepancy. For special females, the correlation between SCAT-V and productive thinking was not significantly different from zero (Table 9). However, when extreme SCAT-V groups are compared, they do show significantly different mean productive thinking scores ($p < .05$), and when extreme productive thinking groups are compared, they show significantly different mean SCAT-V scores ($p < .05$). This discrepancy may be due to a curvilinear relationship or to heterogeneity of variance within the arrays.

With that single exception, analysis of extreme groups produces no different results than correlational analysis for the major variables in this study (cf. Werts (1967) critique of the Holland-Richards research).

Extreme-groups analysis is somewhat more helpful in examining components of the nonacademic activities score, i.e., the domain scores. Groups high and low on SCAT-V were compared on their scores for each of the ten domains, plus subdomains of social service (Wallach items only or Menges items only) and literature (Wallach items only or Menges items only). The same comparisons were made using extreme productive thinking groups. Table 10 summarizes these 112 t tests of which 23 reached $p < .10$.

SCAT-V is related to literary activity (W) for regular males and social service (M) for regular females. Among special students, SCAT-V is related to literary activity (W) for males and to virtually nothing for females.

Productive thinking has no strong relationships for regular males, but it is strongly related to art and social service (M) for regular females. Among special students, productive thinking is related to literature (W) and music for males and strongly to vocational arts for women.

In conclusion, there appears some differentiation between the

Table 10

Extreme-Group Analysis by Domain: Significance Levels of t Tests

Domain	High and Low SCAT-V				High and Low Productive Thinking			
	Reg. M	Reg F	Sp. M	Sp. F	Reg. M	Reg F	Sp. M	Sp. F
1. Leadership	10	--	--	10	--	--	--	10
2. Art	--	--	--	--	--	002	--	05
3. Social Service (W)	10	--	--	--	--	--	--	--
4. Social Service (M)	--	01	--	--	--	02	--	--
5. Social Service (Total)	--	10	--	--	--	05	--	--
6. Literature (W)	01	--	01	--	--	--	05	--
7. Literature (M)	--	10	--	--	--	--	--	--
8. Literature (Total)	01	--	05	--	--	--	--	--
9. Dramatic Arts	--	--	10	--	--	--	10	--
10. Music	--	--	--	--	--	--	05	--
11. Science	--	--	--	--	10	--	--	--
12. Vocational Arts	--	10	--	--	--	--	--	002
13. Sports	--	--	--	--	10	--	--	--
14. Business	--	--	--	--	--	--	--	--

Significance levels $\leq$ .10 are noted.

ability variable (SCAT-V) and productive thinking in that the former is more consistently identified with literary activities and the latter with artistic activities (fine arts, vocational arts).

Other Analyses

In general, multiple regression analysis was rejected because of the weak relationships observed. Scatterplots of selected pairs of variables were examined to identify nonlinear relationships, but none were found.

IV. Discussion

Findings for Regularly-Admitted Students

The data for analysis represented approximately 40% of the 14% random sample of regularly admitted new students (1970): Males = 139, females = 126. Respondents were representative of all regularly admitted students on ACT-C, HSPR, and first semester GPA.

In terms of academic characteristics these students are a highly accomplished group, having a mean HSPR of 86 and a mean ACT-C score (26.3) above the 90th percentile on national norms. Males scored significantly higher than females on ACT-C but had significantly lower GPA; there were no sex differences on SCAT-V and HSPR. All of these academic measures (ACT-C, SCAT-V, HSPR, GPA) are significantly interrelated for both males and females except that SCAT-V does not predict GPA for females.

The productive thinking measure was scored reliably and showed high internal consistency. Students reported an average time of about one hour to complete both parts of the questionnaire. Females scored higher on productive thinking than males, providing an average of 15 more responses across the 12 items. Productive thinking score was related to ability (SCAT-V) and to achievement (GPA) for males. For females, productive thinking was related to no ability or achievement measure.

On the nonacademic activities checklist, females had significantly higher scores than males, although the average difference was only two accomplishments. The content of items which were checked more frequently by females was congruent with cultural expectations. Incidence of nonacademic activities was related to no other variables for males. For females, it was related to ability (ACT-C) and achievement (HSPR) and to productive thinking. Attainments in the domains of fine arts and social service were responsible for the latter relationship.

Comparison with Wallach-Wing Results

Some but not all of Wallach and Wing's (1969) findings were replicated. As in their study, these subjects showed significant interrelationships among measures of ability and achievement. The independence between ability (Wallach & Wing's "intelligence") and productive thinking was replicated only for females. The relationship between productive thinking and GPA was replicated for males; the relationship between productive thinking and HSPR was not replicated.

The relationship between productive thinking and nonacademic activities was replicated only for females. Few relationships between productive thinking and individual domains were found; in fact as many domains were related to ability as to productive thinking. In an analysis of the ACT checklist Elton and Shevel (1969) found that high versus low ability scorers differed on some items. They note that the particular talent being defined and the sex of the respondent have

important bearing on such results.

Responses were not scored for uniqueness. Such additional data may have provided more results consistent with Wallach and Wing. However, at least with regard to nonacademic activities, Wallach and Wing concluded that output rather than uniqueness was the more important variable.

Differences in the two studies may be due to the usual problems of cross-validation. But in addition contextual factors should be considered. There are unknown differences in the applicant pool for Duke University and the University of Illinois. In the three years between studies, student protests had an undeniable impact on the consciousness of students and faculties. Summer, 1970, was post-Cambodia. Many students became more assertive during those years and they may have asserted themselves right out of the sample. Recall that, even though the present students had the inducement of payment which Wallach and Wing did not offer, response rate was about the same as their 40%. It may be that those responding in the two surveys differed in assertiveness, compliance, or other characteristics that may interact with the variables under investigation.

Findings for Specially Admitted Students

The sample for data analysis represented approximately 40% of all new students accepted into the Special Educational Opportunities Program (1970): Males = 39, females = 56. Respondents were representative of all specially admitted students on ACT-V, HSPR, and GPA.

On the four academic measures (ACT-C, SCAT-V, HSPR, and GPA), the only sex difference was that females scored higher than males on SCAT-V. On each of the four measures, special students scored lower than regular students. That is to be expected since a major purpose of the Special Educational Opportunities Program is to recruit students who would not otherwise gain admission. However, the magnitude of these differences suggests that special students are likely to be severely handicapped academically. For example, the difference between group means on ACT-C is three times the standard deviation of the regular group. Special students' ACT-C mean (17.6) is below the 20th percentile on national and the 5th percentile on local norms. Can such students survive at the University of Illinois?

Special students' first semester GPA of 3.25 is .7 of a grade point below that of regular students, a difference much smaller than might be expected from ability scores and HSPR. Research on other groups of students in this program has found comparable results (Menges and Marx, 1972). Bowers (1971) found that after four semesters the mean GPA of special students was .5 of a grade point lower for males and .68 lower for females.

Since these students take some special courses and special sections

of other courses, it is not certain that grading standards are identical with those applied to regular students. Menges and Marx (1972) compared a group of special students enrolled in a special general psychology course with regularly admitted students in a standard course on a set of objective test items used in both courses. Specially admitted students scored significantly lower on pretest, posttest, and gain. However, when special students were divided at a score representing the lower limit of a C grade in the regular course, those with C or higher were shown to have gained as much as regular students, despite their substantially lower admission test scores. A second study involved students in several upper division psychology courses. Special students' course grades, determined from criteria applied equally to regular and special students, were associated with contacts with tutors independent of SCAT-V and prior GPA (Menges, Marx, and Trumpeter, 1972). Thus there is some evidence that, given special services, these students can achieve far more than expected at even a highly selective university.

Although ability measures (ACT-C and SCAT-V) were related and achievement measures (HSPR and GPA) were related, no ability and achievement measures were related to each other. That is, although HSPR does not predict ACT-C or SCAT-V, it does predict GPA for special students, results that contradict Thomas and Stanley's (1969) conclusion of lower predictive validity of HSPR for black students. In this sample of special students, correlations between ACT-C or SCAT-V and GPA were not significantly different from zero.

The productive thinking measure was scored reliably and showed high internal consistency. Special students reported an average of about one hour to complete both parts of the questionnaire, as did regular students, but showed more variability in their estimates. Mean productive thinking score was about 19 responses lower for special students. Productive thinking was related to no academic variables, except to ability (SCAT-V) for males.

On the nonacademic activities checklist, there were no differences with regular students in total score; nor were there differences by sex. When items are considered individually, few sex differences appear, and those that do are congruent with cultural expectations. In comparison with regular students, special students more frequently reported sports and business activities and involvement in programs for social change, e.g., programs growing out of the War on Poverty. Regular students were more likely to be involved in political activities and to play a musical instrument. Nonacademic activities score was related to no other variables.

Differences Between Ability Measures

That ACT-C and SCAT-V, both ability measures, functioned differently in this study deserves comment. They were significantly related to each other with correlations ranging from .46 to .69. However, mean score differences by sex were not consistent; nor were certain correla-

tions with other variables. SCAT-V, but not ACT-C, correlated with productive thinking (males). ACT-C, but not SCAT-V, correlated with nonacademic activities (females). (Note that the correlations were not, however, significantly different from each other.) There are several possible reasons for such findings.

1. SCAT-V may be more heavily loaded on verbal skills than ACT-C; as inspecting test items suggests. Thus SCAT-V could reasonably be expected to correlate with productive thinking, which also has a verbal component, but not with nonacademic activities. Wallach and Wing offer some findings that do not support such an interpretation, however. When they examined relationships between productive thinking and ability using SAT verbal and SAT math separately, they found the same patterns.

2. The two measures were taken under rather different conditions. ACT-C is taken well before enrollment by nearly all students. SCAT-V was administered during part of New Student Week. For special students particularly, some of whom had little hope of college at the time of taking ACT-C, motivation may have been greater while taking SCAT-V. Thus, SCAT-V score may be a truer predictor. That may explain why SCAT-V but not ACT-C correlates with productive thinking for men.

3. Finally, these tests may be too difficult for special students (Bowers, 1971). Scores may be so low that they are an unreliable predictor of GPA and unreliable correlate of HSPR. If so, one expects a rise in scores with college experience but a low test-retest correlation. Smith (1972) using the Graduate Record Examination, reports such findings for high-risk students in Boston University's College of Basic Studies.

Implications

These data suggest that relationships among ability, achievement, productive thinking and nonacademic activities are less clear than was implied by the Wallach and Wing research. Indeed, the present data suggest that productive thinking may be no more useful than academic characteristics for predicting nonacademic attainments.

The power of any of the statistically significant relationships in this study is small. A selection process where predictors account for little more than 25% of the variance is open to criticism. When a characteristic as undeniably important as talented nonacademic accomplishments is not significantly related to the criterion of retention (GPA), even more serious questions should be raised.

What might happen if selection criteria were modified? Such predictions were made by Wing and Wallach (1971) in another analysis of data from Duke's 1967 applicants. They found that if applicants were selected solely on the basis of SAT and high school rank, 70 to 80% would be those who were in fact admitted. On the other hand, if applicants were selected according to nonacademic accomplishments (but

rejecting anyone in the lower half of ACT-C norms or lower third of high school class), only 40 to 50% would be those in fact admitted. This "talented" class would have an SAT mean well over 600, falling above the mean of the applicant pool but below the mean of the actual class. Some of the complexities of attempting to weight academic and nonacademic characteristics are discussed by Baird and Richards (1968).

In the present study, regular and special students did not differ in number of nonacademic activities. There would be a considerable waste of talent if special programs were not available for these low ability students. But bringing them to a selective campus too often pits them against a faculty committed to rigor and standards. "Standards" may translate to little more than highly discriminating objective examinations validated against future academic success (or more frequently against professional intuitions). Thus, to expand the basis for selection may prove to be unfair for student and faculty alike, even though it would soften the practice of using one artificial assessment (admissions test) to predict another (GPA).

As some of the population pressures on higher education decrease, there may be less competition for admission. More students may select than be selected by a college. To the extent that students choose a school because of what <u>they</u> want to do there, there may be an increase in the predictive value of indicators of initiative, such as nonacademic activities. Simultaneously, definitions of acceptable academic behavior, the criteria for retention, would necessarily widen.

Meanwhile, researchers should continue to seek longitudinal data on the relationship of these variables to school and nonschool accomplishments.

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Appendix I

Mail Questionnaire

A condensed version of the questionnaire appears on the following pages. The cover of the booklet was the "Dear Student" letter. The ideational productivity items followed on the next 16 pages; each of the twelve items and each one of the four paragraphs of instructions appeared on a separate page. The nonacademic activities checklist filled the next two pages. On the back cover of the 20-page booklet appeared several final informational questions.

NEW STUDENT PROJECT | UNIVERSITY OF ILLINOIS
Psychology Building | Champaign, Illinois 61820

August 1, 1970

Dear Student:

This questionnaire is part of a study to gather information about new students. We are interested in learning more than the kind of information, such as high school grades, usually on file at the university.

On the attached pages there are a number of questions for you to answer. To be quite frank, these are not 'personality tests' of any kind. Also, they are not academic tests. The responses you make will not be used to evaluate you academically in any way by anybody. Your responses will be kept strictly confidential by the researchers and used only for research purposes.

Please examine the rest of this booklet to decide if you want to answer the questions. They should be answered on your own, of course, without outside help. If you do answer all of the questions, you are entitled to be paid for your effort. We are able to pay $3.00 if you return the completed questionnaire promptly.

You might want to finish the questionnaire now, since the materials are in front of you. We will be happy to send your payment immediately.

Thank you for your help.

Robert J. Menges
Assistant Professor
Psychology Department

Part I

A. The Uses Task (Instructions on a left hand page)

On each of these pages will appear the name of a familiar object. We would like you to write down all the different ways you can think of in which the object might be used. Do not hesitate to write down whatever ways you think of in which the object might be used as long as they are possible uses for the object that is named.

These items follow, each on a separate page:

A newspaper
An automobile tire -- either the tube or the outer tire
A shoe

B. Pattern Meanings Procedure (Instructions on a left hand page)

On each of these pages will appear a pattern of a particular sort. We would like you to write down all the different things you can think of that each complete pattern might suggest. You can turn the pattern around any way you like. Do not hesitate to write down whatever things you can think of, as long as they are possible things that the pattern might suggest.

These patterns follow, each on a separate page:

C. Similarities Task (Instructions on a left hand page)

On each of these pages will appear the names of two objects. We would like you to write down all the different ways you can think of in which the two objects might be alike. Do not hesitate to write down whatever ways you can think of in which the two objects might be alike, as long as they are possible similarities between the objects.

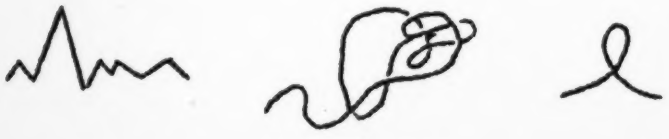
These items follow, each on a separate page:

A potato and a carrot
A train and a tractor
A grocery store and a restaurant

D. Line Meanings Procedure (Instructions on a left hand page)

On each of these pages will appear a continuous line of a particular sort. We would like you to write down all the different things you can think of that each complete line might suggest. You can turn the line around any way you like. Do not hesitate to write down whatever things you can think of, as long as they are possible things that the line might suggest.

These lines follow, each on a separate page:



PART II

Listed below are items describing some possible achievement of students. If an item is descriptive of you, please place an X in the space provided. Do not include achievements or activities occurring before the ninth grade or done as part of class work.

LEADERSHIP	Yes	No
Participated as an active member of one or more student organizations	[ ]	[ ]
Nominated for or appointed to office in a student organization	[ ]	[ ]
Elected president or chairman of a student organization	[ ]	[ ]
Elected president of student government or class	[ ]	[ ]

ART		
Created art work such as painting, drawing, sculpturing, cartooning, photography (not as part of a course)	[ ]	[ ]
Had art work exhibited or published	[ ]	[ ]
Entered an artistic competition or contest	[ ]	[ ]
Won a prize or an award in art competition	[ ]	[ ]

SOCIAL SERVICE		
Actively participated in programs sponsored by community or church groups, such as Scouts, 4-H Clubs, YMCA, YMHA, CYO	[ ]	[ ]
Actively participated in programs of such groups as the Model Cities Program, Economic Opportunities Coumcil, Neighborhood Youth Corps, etc.	[ ]	[ ]
Elected or appointed officer of such a group	[ ]	[ ]
Received an award or prize for work in service group	[ ]	[ ]
Worked as a volunteer in a child care or tutoring program	[ ]	[ ]
Did volunteer work for political candidates or political organization	[ ]	[ ]
Participated in activities designed to change discriminatory social conditions, such as illegal hiring practices or substandard housing	[ ]	[ ]

LITERATURE		
Wrote original poems, plays, stories, articles, essays (not as part of a course) but have not published	[ ]	[ ]
Published original writings in school paper	[ ]	[ ]
Had original writings published in public newspaper, magazine, collection (not school publication)	[ ]	[ ]
Published original materials in a school or community underground newspaper or magazine	[ ]	[ ]
Won a literary prize for creative writing	[ ]	[ ]
Worked on editorial staff of school paper or annual	[ ]	[ ]
Worked on editorial staff of underground newspaper or magazine	[ ]	[ ]
Edited school paper or annual	[ ]	[ ]
Edited an underground newspaper or magazine	[ ]	[ ]

	Yes	No
DRAMATIC ARTS		
Participated in activities of speech, debate, or drama group.	[ ]	[ ]
Participated in a dance group	[ ]	[ ]
Played minor role in cast or crew of production sponsored by school, community, or religious groups; or entered debate or speech contest	[ ]	[ ]
Received an award for acting, playwriting, or other phase of dramatic production	[ ]	[ ]
Won an award in state or regional speech or debate contest	[ ]	[ ]
MUSIC		
Played a musical instrument.	[ ]	[ ]
Sang as a soloist or member of a group	[ ]	[ ]
Composed or arranged music	[ ]	[ ]
Performed music with school or community group	[ ]	[ ]
Organized or led a musical group	[ ]	[ ]
Won prize in musical competition	[ ]	[ ]
Participated as a regular professional musician, or had professional performances given of music composed or arranged	[ ]	[ ]
SCIENCE		
Participated as a member of a science club or reading and discussion group.	[ ]	[ ]
Built a piece of equipment or laboratory apparatus (not as part of a course)	[ ]	[ ]
Appointed teaching or laboratory assistant.	[ ]	[ ]
Entered scientific competition.	[ ]	[ ]
Won first, second, or third prize in a state or regional science contest	[ ]	[ ]
Attended a summer science program sponsored by the National Science Foundation	[ ]	[ ]
VOCATIONAL ARTS (OUTSIDE OF CLASS)		
Designed clothes, jewelry, or household furnishings.	[ ]	[ ]
Built or rebuilt mechanical devices such as cars and cycles	[ ]	[ ]
Had such work entered in a contest	[ ]	[ ]
Won a prize or award in such competition	[ ]	[ ]
SPORTS		
Participated in organized school or neighborhood sports (outside of class.	[ ]	[ ]
Served as captain of a team.	[ ]	[ ]
Coached or umpired for sports events.	[ ]	[ ]
Served as manager or cheerleader for athletic events	[ ]	[ ]
BUSINESS		
Participated in the business management of a school or nonschool activity.	[ ]	[ ]
Served as business manager of a sports, newspaper, music or other group	[ ]	[ ]
Organized and managed a business for fun or money-making purposes	[ ]	[ ]

Did you hold a job during your last two years of high school? If so, write here the average number of hours you worked per week (do not count summers)____.

Perhaps there are other nonacademic activities in which you have participated but which were not mentioned above. If so, please describe them here.

How much time has it taken you to fill out the entire questionnaire?_____

Thank you for your help.

I have answered these questions carefully and without assistance.

*Signature*_____

Please indicate below which method of payment you prefer.

____Send a check by return mail to the address below.

____I will pick up my payment after I arrive on campus. (Payment by cash in Rm. 2, Psychology Building, after Sept. 21, 8AM to noon and 1 to 5 PM.)

Print name_____

Home address_____

_____

_____

zip

Social Security Number (necessary to issue check)_____

I-6

Appendix II

Supplementary Analysis: Implicit Time Constraints in the Measurement of Productive Thinking

Researchers have been concerned with the effects of the setting in which productive thinking data are gathered. Several investigators have contrasted test-like administration with game-like administration. Dentler and Mackler (1964) and Vernon (1971) found more high scores under the latter (relaxed) conditions, whereas Kogan and Morgan (1969) found no differences.

In the present study it is possible to compare mail respondents with subject pool respondents. Neither group was given a time limit. Instructions to the mail group (see App. I) made no mention of time. Oral instructions to the subject pool group included the following: "Instructions are in the booklet. Please take as much time as you wish to take. As you leave we will give you a mimeographed description of the purpose of the research and will be glad to answer other questions." Furthermore, no decisions about any individual's future depended on his performance. Thus, the contrast is between responses on a questionnaire filled out at home for a small cash payment and one completed with a group in a classroom to satisfy part of a requirement to participate in research. Both settings are relaxed and neither imposed explicit time constraints. Therefore, no difference in performance was expected.

A highly significant difference ($p < .002$) on time spent on the questionnaire was found as shown in Table 1, with the mail respondents taking about twice as long. As might be expected, the mail group had higher productive thinking scores ($p < .02$). Finally, the mail group checked more nonacademic activities ($p < .05$). On other characteristics the groups did not differ: ACT-C, SCAT-V, HSPR, GPA. Both groups were representative of all freshmen on these academic measures.

Although there is no way of knowing if estimates of time spent on the questionnaire were accurately reported by the mail respondents, it was possible for the investigators to verify reports of the subject pool respondents. To our surprise we found systematic overestimation, probably in order to insure getting credit for two hours of experimental participation. And so the difference between groups in time, though not in scores, would be less if it were based on student's self-reports.

These results suggest that there were important differences between conditions. Apparently there were constraints <u>implicit</u> in the subject pool classroom to finish quickly, even at the cost of performance quality.

A second question is of interest, once we grant that implicit time constraints depressed the level of responding for the subject pool group.

Table 1 App. 2

Mean Scores for Mail and Subject Pool Respondents

		Mail					Subject Pool						
		M	F	T	t	p	M	F	T	t	p	t	p
ACT-C	N	139	126	265			53	36	89				
	M	27.06	25.52	26.33	4.20	.002	27.51	25.08	26.53	4.29	.002	.53	n s
	SD	2.68	3.28	3.07			2.35	2.97	2.86				
SCAT-V	N	138	126	264			50	35	85				
	M	31.43	32.24	31.82	.70	n s	31.66	32.89	32.16	.71	n s	.31	n s
	SD	9.23	9.43	9.32			8.63	6.62	7.84				
HSPR	N	139	126	265			53	36	89				
	M	84.85	87.52	86.12	1.79	.10	85.57	84.89	85.29	.25	n s	.55	n s
	SD	13.45	10.50	12.19			11.62	14.10	12.60				
GPA	N	138	124	262			53	36	89				
	M	3.87	4.06	3.96	2.14	.05	3.67	4.18	3.88	3.23	.002	.90	n s
	SD	.72	.71	.72			.73	.76	.78				
Time	N	139	124	263			53	36	89				
	M	1.10	1.13	1.12	.40	n s	.68	.68	.68	.07	n s	6.42	.002
	SD	.60	.68	.64			.17	.16	.16				
Prod thkg	N	139	126	265			53	36	89				
	M	63.06	78.12	70.22	4.22	.002	61.15	63.44	62.08	.69	n s	2.46	.02
	SD	25.27	32.71	29.95			15.33	15.45	15.33				
Non-ac	N	139	126	265			53	36	89				
	M	11.14	12.98	12.01	2.76	.01	9.58	12.28	10.67	2.65	.02	2.05	.05
	SD	5.32	5.52	5.48			4.28	5.29	4.87				

Does that depression also affect relationships between variables? For example, is the correlation between productive thinking and ability higher in the subject pool group than in the mail group because of the implicit time constraints?

Wallach and Kogan (1965) argued that the independence of intelligence from creativity is maximized when the latter is tested under relaxed conditions. Van Mondfrans et al. (1971) found lower correlations with IQ when creativity was assessed under relaxed conditions. However Vernon (1971), Kogan and Morgan (1969) and Sherwood (1968) found essentially zero correlations between intelligence (ability) and productive thinking measures regardless of administration condition. After reviewing a number of such studies, Wallach (1971) concludes "a permissive context for assessing ideational fluency is not necessary to demonstrate its independence from intelligence" (p. 14).

The present data support that conclusion. Tables 2 and 3 present intercorrelation matrices separately for males and females. Tests were made to determine if members of each pair of coefficients (mail versus subject pool) were different. Differences were found for only two pairs, both involving males. Correlations were significantly higher for mail than for subject pool males a) between HSPR and ACT-C ($p < .05$) and b) between HSPR and SCAT-V ($p < .02$).

There is no evidence that productive thinking is related to other variables differently in the mail group than in the subject pool group. However, HSPR does function differently. For males it is more highly correlated with both ability measures in the mail group than in the subject pool group. This finding is difficult to interpret since the groups did not differ on HSPR. We might speculate that there is a component of "school success" for males wherein ability and achievement are closely related. If this component also includes a behavioral pattern of compliance, we might expect it to be more prominent among those who return questionnaires (the higher correlations) than among those who attend appointments for a required subject pool (the lower correlations).

For the present study it seemed unwise to include subject pool respondents in further analyses because of the different constraints, more implicit than explicit, under which they were tested.

Table 2 App. 2

Intercorrelations of Selected Variables for Males

	ACT-C	SCAT-V	HSPR	GPA	Prod thkg	Non-ac
ACT-C	---					
SCAT-V	65[a] (138)[c] 66[b] (50)	---				
HSPR	53 (139)[d] 25 (53)	43 (138)[e] 04 (50)	---			
GPA	34 (138) 18 (53)	28 (137) 16 (50)	31 (138) 26 (53)	---		
Prod thkg	10 (139) 17 (53)	19 (138) 08 (50)	06 (139) 12 (53)	24 (138) 18 (53)	---	
Non-ac	07 (139) -00 (53)	-01 (138) -04 (50)	11 (139) -03 (53)	02 (138) 25 (53)	07 (139) 30 (53)	---

[a]Mail respondents

[b]Subject pool respondents

[c]N given in parenthesis

[d]This pair of correlations is significantly different ($p < .05$)

[e]This pair of correlations is significantly different ($p < .02$)

05

Table 3 App. 2

Intercorrelations of Selected Variables for Females

	ACT-C	SCAT-V	HSPR	GPA	Prod thkg	Non-ac
ACT-C	---					
SCAT-V	69[a] (126)[c] 58[b] (35)	---				
HSPR	47 (126) 63 (36)	27 (126) 32 (35)	---			
GPA	20 (124) 39 (36)	12 (124) 35 (35)	33 (124) 47 (36)	---		
Prod thkg	03 (126) 20 (36)	06 (126) 23 (35)	08 (126) 04 (36)	07 (124) 43 (36)	---	
Non-ac	21 (126) -03 (36)	17 (126) 10 (35)	34 (126) 03 (36)	17 (124) -04 (36)	27 (126) -04 (36)	---

[a] Mail respondents

[b] Subject pool respondents

[c] N given in parenthesis

None of the paired correlations are significantly different